New Validation Suite for the Community Coordinated Modeling Center

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Abstract

In a study done of the factors that affect the success of video games, it was found that 87% of the users agree the display of the game demo will affect their decision to continue playing the game. Thus, the display of software is a significant factor in software effectively providing a service to its users. The Community Coordinated Modeling Center, as one of its core services, provides validation of space science models for the international Heliophysics community, but the current validation suite and existing toolset was identified as an ideal candidate for a comprehensive overhaul to improve the usability of the tools while also improving the user experience. To solve this problem, a new web application that upgrades the layout and has enhanced navigation will replace the current suite. The new validation suite will replace a text heavy page with a geometric layout and a graph of observed and modeled data over time. The new system will also calculate the accuracy of the chosen model into a set of scores. Finally the new tool will be easily modifiable for future upgrades and versions. Through continuous use of the new validation suite, models and forecasters will increase in accuracy of their predictions.

Background

Space weather refers to the variable conditions on the Sun and in the space environment that can influence the performance and reliability of technological systems on and around Earth. The CCMC provides, to the international research community, access to modern space science simulations. In addition, the CCMC supports the transition to space weather operations of modern space research models. A key activity in advancing space science research is model validation and the CCMC's current validation suite has been identified as in need of an upgrade.

The new suite will have to overcome certain challenges:

- ➔ Text heavy page
- ➔ No graphical user interface
- ➔ Lengthy navigation to the time series tool

The new suite will utilize tools from the old suite:

- ➔ Validation methods in the form of "Skill Scores"
- ➔ Event based validation

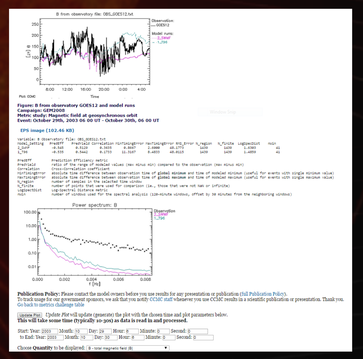

Figure 1. The layout of the current time series plotting tool in the validation suite.

Web-Application

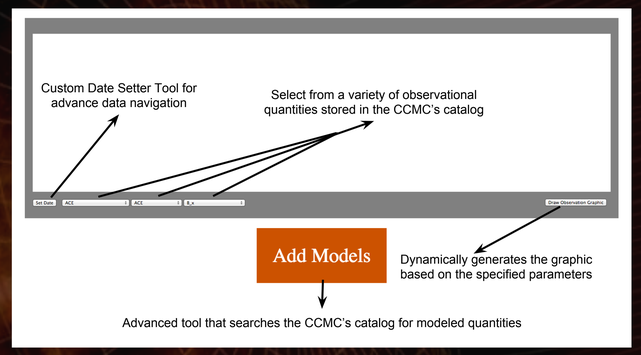

Figure 2. The Layout of the new suite is simple and only requires one page.This is the layout of the suite after the user inputs the selected timeline dates, observation resource, and quantity of measurement. Each input affects the graph of data displayed and which models to compare.

Figure 3. The graph is generated and maintains a prominent location on the page after it's generated. This allows the user to focus on the graph once it is generated. The timespan of data shown can be adjusted through the zoom buttons to the button right of the graph, the slider below the graph, and the From/To box at the bottom left of the graph.

Figure 4. By clicking on the "Add Models" button, the user can add modeled data of the same quantity. Allowing models to be displayed side-by-side creates the opportunity for model analysis and validation. The bulk of this program is comparing datasets for validation.

Features

The webpage containing the new validation suite will feature:

- ➔ Event based validation and select Real-Time validation model runs
- ➔ Calculates model accuracy and displays it in the form of "Skill Scores"
- ➔ A graphical representation of observed data and model data
- ➔ Simple straight line navigation from Event to Observed data set
- ➔ Database integration
- ➔ Advanced graph options for user to differentiate between data sets
- ➔ New simplified layout
- ➔ Easily modified and documented code

Skill Scores

	Average Quantity Value	Average Model Variant	RMS Error	Predicted Efficiency
B_x from SWMF2008aGOES13	45.020732308497	47	41.8865	-0.110

Figure 5. An example of how the "Skill Scores" are displayed. The "Skill Scores" are measurements of accuracy per model. The model is analyzed through its Average Variant, Root Mean Sum Error, and Predicted Efficiency. This feature of the tool is currently still in development.

Conclusion

Through the new validation suite,

- ➔ The effectiveness of the metrics and validation suite will increase
- ➔ The international heliophysics community will better judge models

In the future,

- ➔ This tool will assist in closing the gap between research and application
- ➔ It will help validate the ~14,000 model runs at the CCMC
- ➔ Include more event based validation runs

Acknowledgements

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